

Replayability in Video Games

Jack Giddens

Contents

Abstract	2
Intro.....	2
Literature review.....	3
Research Question	5
Proposed Solution	5
Conclusions	8
References.....	9

Abstract

This proposal investigates the elements of replayability and the specific ways to encourage it in video games. Replayability in video games is a super important aspect to cover as we learn in this proposal that there is a positive correlation between player enjoyment and replayability. By looking into insights on replayability and factors that contribute to encouraging it in game design, it allowed me to create my own methodologies in creating high replay value in my own game design. Many of the sources I investigated gave different insights and perspectives to create replayability in game design. This allowed me to understand what contributes to high replay value and in turn helping me answer my research question: How can replayability be encouraged in a game with a simple core gameplay loop? I used randomisation and variance found in roguelike games to create replayability and introduced the idea of permadeath and the positive implications of it in my game design. Additionally, I implemented a methodology called “Periodic Dilemma Generator” to ensure that player choices are meaningful, dilemmatic and yield unpredictable outcomes encouraging replayability, hence addressing the answer to my research question.

Keywords: Video Games, Replayability, Game Design, Player Enjoyment, Game Development, Interesting Choices

Intro

In 1948, 3 years after World War 2 ended, Alan Turing and David Champ wrote a theoretical chess simulation which became the first piece of video game code ever written. Since then, the evolution of the gaming industry and the technological advancements that followed has led to the prominence of two major game development programs - Unity and Unreal Engine. These software platforms have played a crucial role in shaping how games are developed today. (Hai Ha, 2022) further covers the capabilities of both engines, highlighting the differences between each software program and giving an insightful approach in deciding which program is best suited for different types of projects. However, the paper's focus is on Unreal Engine exploring its features and providing a comprehensive analysis on the engine's potential. (Hai Ha, 2022) emphasises the importance of graphics in a game engine. A game development software that limits you graphically, limits your potential. Unreal handles this crucial aspect adeptly, and is capable of creating amazing graphical fidelity for games with its photorealistic visualisations and

offering high-quality assets from a variety of sources. Offering this in a software program creates a high ceiling for creativity as a developer which is very important as graphics create player immersion (Hai Ha, 2022).

The motivation behind this proposal is to create a game that promotes replayability as these games usually offer richer and more engaging experiences for players. When someone wants to buy a game replayability is important to them. This idea of replayability increases the game's value as players want to play them again and again. As replayable games are to be played multiple times, a player can get more 'play time' out of them which increases the player's perception of value in that particular game. This is very attractive to game developers. It is believed that there is a correlation between the success of a video game and replayability (Aghekyan, 2021). This is easy to understand as if a game makes a player want to repeat an experience, the initial experience must have been engaging and entertaining enough for them to want to relive it. This idea is what I was interested in investigating further as I wanted to know how I can design my game to offer a similar experience where the player is left wanting to relive that experience (replayability). By offering an experience that can be enjoyed repeatedly I hope that this will in turn create an experience that is fun, engaging and addictive for players.

I begin by looking at many sources to get a vast understanding of different perspectives and methodologies surrounding replayability. I investigate aspects such as immersion, understanding the factors that contribute to replayability, understanding how we can make decisions and choices interesting, the effects of permadeath in roguelike games and unrepeatable experiences. These different areas of research gave me a comprehensive understanding of what makes a game replayable which helped me shape my solution. The solution consists of applying roguelike features such as randomness and permadeath to my design and applying the "Periodic Dilemma Generator" (PDG) to certain game features to encourage replayability in my proposed simple core gameplay loop.

Literature review

As mentioned in the introduction, good graphics create more immersion; this concept of immersion is further investigated by (Krall & Menzies, 2012). Immersion gives the player the sense of being in the entertainment world as opposed to the real world. This idea is described as the "Magic Circle" by Johan Huizinga to accommodate the idea of immersion in games. When a player is inside this imaginary mental construct, the game world is believable and the player is fully immersed in the virtual world, however players enter and exit the circle regularly, so it is important to prevent these distractions. If distractions are managed and limited, then immersion is possible. (Krall & Menzies, 2012) also addresses replayability in video games and emphasises the importance of it in video game development from a software engineering perspective. They break down replayability into 6 different aspects to use in their research methodology to gain a more comprehensive understanding of the factors that contribute to the replayability of a game. Based on their findings, they then introduce a game design methodology to improve a game's success. Additionally, they provide an insightful way of how a game can be tuned to accommodate more features that contribute to certain aspects of replayability. A research gap is recognised by the authors that acknowledges the need for further research and refinement in categorising games, a faster collection of more data, how they analyse gaming data, and refinement of design methodology (Krall & Menzies, 2012).

(Aghekyan, 2021) further analyses replayability by investigating the properties that make a game interesting by focusing on a concept called the Periodic Dilemma Generator or PDG. (Aghekyan, 2021) emphasises early on that the success of video games are very closely correlated with replayability, looking into the difficulties of how we define it and how to achieve it. For a game to enhance its replay value it should incorporate a PDG system as a tool to analyse and design games. The article mostly focuses on hyper casual games but believes that the conclusions drawn from this concept can be directly applied and extended to all types of games regardless of their genre. (Aghekyan, 2021) uses the PDG to explain and properly understand what it means for a choice or decision in a video game to be interesting. He believes by offering interesting choices or decisions that a game can increase its replay value. The Periodic Dilemma Generator aims at making a game more replayable by considering these three parameters. The choices a player makes are to be meaningful, choices are to be dilemmatic, and the outcome of a choice is unpredictable in terms of achieving the goal. (Aghekyan, 2021) believes that “high replay value games have one or more PDG systems built into the core loop of the game” and are “a necessary and sufficient condition for a games replayability”. Put simply, PDGs provide players with interesting choices.

Aghekyan, Krall & Menzies provide useful tools and methods to improve player enjoyment and replayability in game design. Understanding replayability in game design can be further studied by looking into “roguelike games” which are suggested to create high replayability value using randomisation and variance (Bycer, 2020). (Wilson, 2019) explores the idea of enhancing the gaming experience by looking into the design and impact of roguelike games with a particular focus on permadeath. Drawing from the experience of game developers such as Tom Cadwell and Justin Ma, (Wilson, 2019) examines the significance of managing player expectation in roguelike games through the development of six roguelite and roguelike projects. Cadwell suggested that players should have an expectation for failure and use cues to convey the likelihood of death. By setting player expectations for failure, roguelikes can offer an enjoyable new novelty by pushing players outside of their comfort zones. Ideally, players are “made comfortable outside of their comfort zones.” The data found in (Wilson, 2019) user study supports Candwells claims and highlights the positive correlation between player enjoyment and the expectation of failure. The highest average engagement and fun scores were found when players exhibited low confidence and vulnerability scores because players did not feel the need to win or expect to win, rather they typically enjoyed their experiences. The study also showed that permadeath in roguelike games increased player perception of engagement, fun and content. Ma also suggests making the early stages of a game interesting and full of variety as that is the section most players will encounter most often. This can also help set initial expectations which is an important goal for game designers when trying to prepare players for roguelike permadeath. Although (Wilson, 2019) sheds light on how permadeath can impact engagement, fun and play patterns there is still a need to further research how these experiences may vary across different player demographics. Addressing this gap could help further understand and generalise discoveries.

Expectation and awareness of failure has an important role in player engagement and fun. Due to the randomisation of roguelike games the player’s experience on each playthrough will vary meaning no two experiences will be the same. This idea of unrepeatable experiences is what (Monedero March, 2019) explores as he presents a comprehensive framework to understand the events leading up to different

unrepeatable experiences. The framework consists of 6 characteristics designed to describe and distinguish different types of unrepeatability. These being: limiting events, lost aspects, replacement, reach, player awareness and player motivation. Through a series of case studies (Monedero March, 2019) applies the framework to many examples of unrepeatable game experiences, highlighting its effectiveness in each case and providing valuable insights and points of reference for game designers to adopt. Although (Monedero March, 2019) provides us with valuable groundwork for understanding unrepeatability, further research into examining the specific effects that unrepeatability has on players and their engagement with games would be very illuminating and help fill gaps in his research.

Research Question

Based off the research gathered we can understand the importance of immersion and replayability in game design, the potential of the Periodic Dilemma Generator to enhance replay value, the effects of permadeath in roguelikes games and the characteristics of unrepeatable experiences. Taking these points from the research into consideration I am searching for an answer to the following question:

How can replayability be encouraged in a game with a simple core gameplay loop?

Proposed Solution

Below is a very simple flow chart representing the games simple core gameplay loop:



To encourage replayability in this simple core gameplay loop I am going to design my core gameplay loop with roguelike features in mind. As mentioned in the literature review the roguelike genre is known for using randomisation and variance to enhance replayability in games. “The best roguelike games deliver minutes of entertainment that can then be repeated with variance and new challenges again and again.” (Bycer, 2020) The focus of a single run in a roguelike contributes to their excellent pick up and play quality, a feature that a lot of other games struggle with. Not only do they achieve high replayability but they allow developers to focus more on supplemental content that adds more variance rather than length to the expansion of a game (Bycer, 2020). This will help keep the game's features and core loop simple.

The game will achieve randomization and variance in each playthrough as follows:

Procedurally Generated Maps: At the beginning of each playthrough, the game will generate a random level each time for the player. This means no two playthroughs will be the same, nor will players be able to learn levels and exploit weaknesses in map design. Each playthrough will provide unique and interesting challenges for the player to overcome.

Player Upgrades: When a player earns enough xp by killing enemies the player will be given three random upgrades to choose from. These upgrades will vary in mechanics and rarity. The rarer the upgrade the better statistics it will give. The player can also spend currency earned in game to reroll these three random upgrades if they wish to try and roll better. Because player upgrades will be random

each time, the strength of a player's character will also vary between playthroughs as character statistics will be changed based on luck of upgrades and choice of upgrades. This will give a unique feel to each character.

Enemy Spawn Rate: The rate at which enemies will spawn will vary “slightly”. If there was too much randomness to this then in some playthroughs the enemies might spawn too fast making gameplay too difficult and vice versa if enemies spawn too slowly then the game will feel too easy. We want to keep the player in the “flow channel” so the player remains engaged and motivated to continue playing (Vang, 2022). By balancing it so enemies feel challenging each time but still random is key. The purpose of making enemy spawn rate feel random is so the player doesn't feel as though enemy's spawn the same way each time. If this was the case, a player can learn the spawning patterns and will be prepared for what is to come. By keeping the spawn rate slightly random, the player is always left wondering what is next to come.

Level Events: During each playthrough there will be two events that take place randomly - Enemy Invasions and Supply Drops. The player will be informed of when these events take place, but the time in which they take place each run-through will vary. Also, it is possible for multiple invasions and supply drops to take place in one level.

Now we know how we can achieve randomisation and variance in our game, the next aspect to focus on is permadeath. As we know from (Wilson, 2019) this has a significant impact on the players experience. During a playthrough, due to the random nature of the gameplay, our players' characters are going to become increasingly unique as the game progresses. Upon dying, everything that made the players character unique is then lost. It is important that we prepare the player for this possibility as we know from (Wilson, 2019) there is a correlation between player enjoyment and the expectation of failure. If players are aware of the possibility of death and understand the repercussions of failure, then the player will likely put more weight on their decisions, as the unique progress they have made will be at risk. This in turn will make the game feel more interesting and success will feel more rewarding, encouraging replayability (Wilson, 2019).

I plan to set player's expectations by the way I spawn enemies. Enemies should feel like a never-ending swarm. This is not to say that there will be too many enemies for the player to handle so death is a given; but rather that death is always a possibility as there are always enemies around to kill you if you do not play skilfully. Damage will also introduce players to the likelihood of death from early stages as players will be learning the game and will likely take damage. As players see their health go down, they will begin to understand that death could be expected. After dying for the first time, players will then fully understand the effects of a roguelike permadeath, hence expectations will have been set and this should increase players perception of engagement, fun and content (as backed from the results found in

study by (Wilson, 2019)). This will encourage replayability and help support the answer to my research question.

Here is a visual representation of the interaction between the player and the enemy using a UML sequence diagram.

Another methodology I am going to utilise in my project to help answer the research question is the implementation of the Periodic Dilemma Generator (PDG) in certain aspects and mechanics of my game. Specifically, when the player's character levels up, as the PDG system should be built into the game's core loop. PDG suggests that by making choices or decisions interesting it can enhance replayability in your game therefore helping me answer my research question (Aghekyan, 2021).

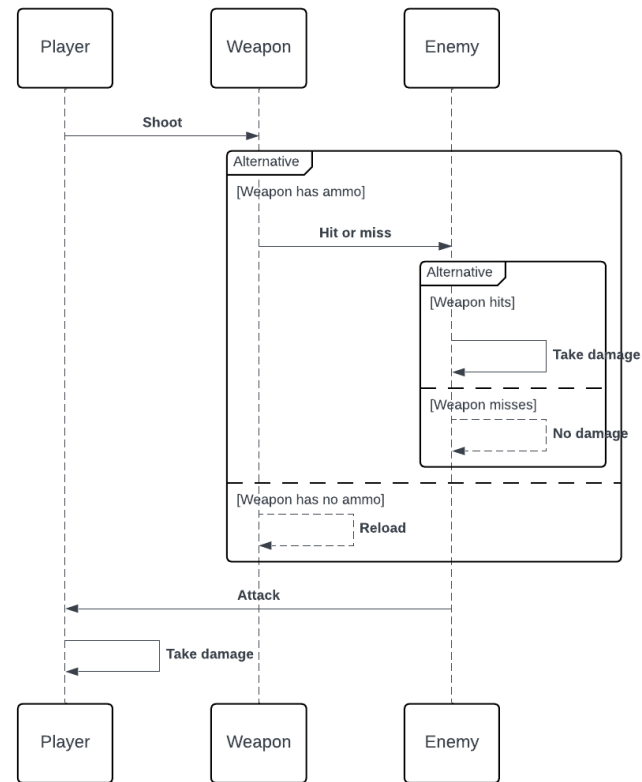
The systems presented choices should align with the following properties:

- **Choices are meaningful**, i.e. they satisfy the following two sub-criteria:
 - Informed choices - the system should provide you with both the cost and the benefit of every choice.
 - Choices with consequences - the choices make a difference, i.e. they affect the system's state by bringing you closer to the goal or taking you further away from reaching it.
- **Choices are dilemmatic**, i.e. choices are conflicting and in every situation, there is no optimal answer.
- **The outcome of a choice is unpredictable in terms of achieving the goal**, i.e. there is no choice, that is guaranteed to achieve the goal. And there is no situation where, despite available choices, reaching the goal is impossible.

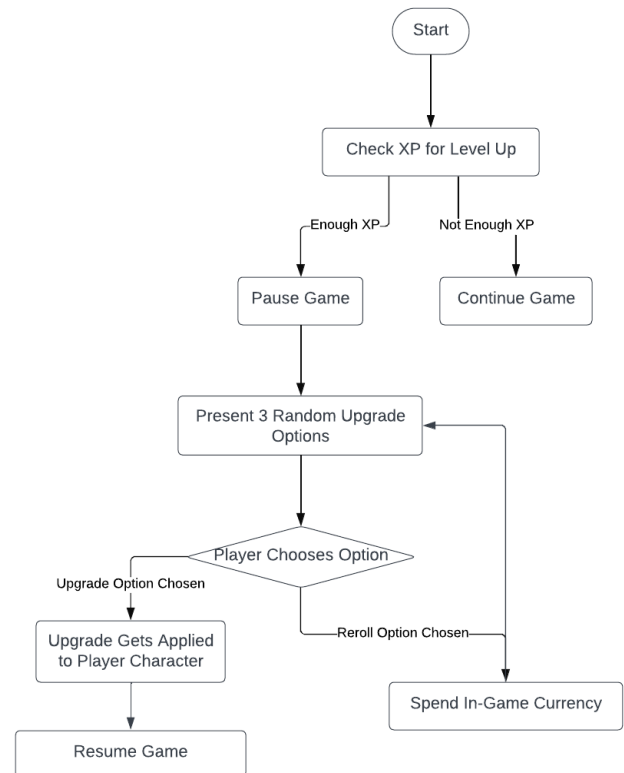
(Aghekyan, 2021)

By using this checklist, I can design my game mechanics in a way that meets these three requirements which in turn should provide players with interesting choices and encourage replayability. First, I will explain how the feature works and then I will show how I have applied PDG in the design of the game mechanic, meeting all three parameters.

When a player levels up they will be given a choice of three upgrade options of which they can choose one. Each upgrade option is a completely random upgrade to the performance of the player's character. The choice of upgrades can range from an increase to player walk speed, an increase to xp gain on pickup, an upgrade to weapon damage, fire rate, reload speed, etc. Each upgrade will be of different



rarity. The rarer the upgrade the greater the benefits it will have on the player's character. Players will also be given the choice to spend currency, earned in their playthrough, to reroll and get three new upgrade options in the hope of getting better/rarer upgrades. We can visualise this process in the flow chart diagram to the right.



Meaningful choices: The player is making **informed choices** as they know the benefits of the upgrade when they select it. These choices may also come with **consequences**. If the player does not choose upgrades optimally the player may be lacking in certain areas. For example, players could struggle to kill enemies due to lack of upgrades in damage because they decided to invest in more armour and health upgrades, thereby making it difficult to perform/complete certain tasks.

Choices are dilemmatic: Every time the player is deciding what area to upgrade the choice is always dilemmatic. Should the player upgrade weapon damage but miss out on armour or health upgrades. Should a player risk rerolling all the upgrades in the hope to get better upgrades or rarer upgrades. By giving these dilemmatic scenarios, the player is always left with choices that are conflicting and, in every situation, there is no optimal solution.

Unpredictable outcome: As previously mentioned the choice of upgrade is not obvious. Each time the player levels up they are faced with the same dilemmatic choices. Because of this uncertainty the long-term benefits of each upgrade are unknown to the player. A player does not know if a 15% weapon damage increase is going to result in a successful run. It is possible for a player to improve and understand the game better which means they can make more optimal decisions when upgrading but this does not guarantee a winning result. While it might greatly improve their chances of winning, there is still an uncertainty surrounding the outcome of each decision they make.

With the implementation of the PDG system in my game it should help provide interesting and meaningful choices to the player, enhancing and encouraging replayability, hence helping me answer my research question.

Conclusion

This proposal offers a comprehensive approach to enhance replayability in a game with a straightforward core gameplay loop. By understanding the methods in creating replayability in game design I was able to apply this knowledge and create a solution that should enhance the player's experience. The main points I covered were: understanding the factors that contribute to replayability, understanding how we can make decisions and choices interesting, understanding the effects of

permadeath in roguelike games and understanding unrepeatable experiences. These points paved the way for my proposed solution that consisted of the implementation of roguelike features, permadeath, and the Periodic Dilemma Generator methodology which ultimately addressed the research question “How can replayability be encouraged in a game with a simple core gameplay loop?”.

References

Hai Ha, T. (2022). *Game Development with Unreal Engine*

<https://www.theseus.fi/bitstream/handle/10024/751778/Ha%20Hai%20.pdf?sequence=2>

Krall, J., & Menzies, T. (2012). *Aspects of Replayability and Software Engineering: Towards a*

Methodology of Developing Games https://www.scirp.org/pdf/JSEA20120700001_38193851.pdf

Aghekyan, N. (2021). *Replayable Games – Game Mechanics As Periodic Dilemma Generators*

<https://www.gamedeveloper.com/design/replayable-games---game-mechanics-as-periodic-dilemma-generators-pdg-#close-modal>

Wilson, J. B. (2019). *Roguelife: Digital Death in Videogames and Its Design Consequences*

<https://dspace.mit.edu/bitstream/handle/1721.1/127723/1196239202-MIT.pdf?sequence=1&isAllowed=y>

Monedero March, J. (2019). *You Can (Not) Replay: Unrepeatable Experiences in Games*

https://www.researchgate.net/publication/334286008_You_Can_Not_Replay_Unrepeatable_Experiences_in_Games

Bycer, J. (2020). *The Importance of a Well Defined Core Gameplay Loop*

<https://www.gamedeveloper.com/design/the-importance-of-a-well-defined-core-gameplay-loop>

Vang, C. (2022). *The Impact of Dynamic Difficulty Adjustment on Player Experience in Video Games*

<https://digitalcommons.morris.umn.edu/cgi/viewcontent.cgi?article=1105&context=horizons>